FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 85 Thursday, August 5, 1948 No. 1666

49, Wellington Street, London, W.C.2
'Grams: "Zacatecas, Rand, London"
'Phone: Temple Bar 3951 (Private Branch Exchange)
PUBLISHED WEEKLY: 26s. per annum (Home and Overseas)

The Management Conference—II

The Management Conference arranged by the Council of Ironfoundry Associations gave considerable thought to human relationships in industry. When a concern is quite small, and the owner knows the family life of each one of his men, then, if he is of normal mental outlook, there is but little need to worry about human relationships—they will usually be humane, if not cordial. These small concerns grow and the time arrives when the owner must delegate some of his activities. With the largest foundries, serious efforts are made to replace the close contact between employee and employer of the smaller companies, by a benevolent, yet carefully thought-out system. The system at Stanton was lucidly described by Mr. J. E. A. King, their labour manager. The full-time works doctor, through his professional position, is instrumental in grading entrants to the industry and others passing through his hands. He classifies the employees in such a way that a foreman has a good chance of getting a suitable type of man for any vacancy which arises. Moreover, when a serious disablement accident arises, thought is immediately given to placing the man in a new position where his injury will be of no detriment to the carrying out of his duties. He cited a case of a man losing his right arm. At the earliest opportunity—and this is important—the firm discussed with the patient his new job. This was to be the hammer testing of pipes for soundness, using the left hand. The man has so progressed in the organisation, that he now earns more money with one arm than he did with two. Recently, after making provisions for safe entry to and from the cab, one manager demanded from the labour department the supply of a one-legged man. Hereby we received a clear picture of the steps taken by the largest concerns to secure a homogeneous and happy working team. The Conference seemed to be satisfied that the smaller firms, through personal contact, and the largest, through the creation of a special department, could go far to solve the problem of human relationships. There still remain many difficulties with the medium-size concern, wherein the "boss" is somewhat remote from the shop floor, whilst the organisation is yet too small to create a special department.

Much investigational work is proceeding to ascertain the aspirations of the varying types of employees, for an understanding of these does help the management to form a sane policy of human relations. On the other hand, there are all sorts of mental complexes to satisfy. The case was cited of turmoil being engendered in one shop because Mrs. Mary Jones, the forewoman, known either as Mary or Mrs. Jones, had been addressed by a new manager as Jones! The search for something to replace the foreman's bowler hat is also exercising the minds of not a few executives. This seems all the more necessary in these days, when his jobs, like those of the owner of the growing foundry, need a certain amount of delegation. It is our opinion that, in its essentials, delegation should be at a minimum. The practical interpretation of the Board's policy and responsibility for discipline are two that must remain unimpaired.

A sound policy of human relationships must emanate from the head, for on this the progress of a manufacturing organisation depends. In this connection we recall a remark made by Mr. Robert R. Hyde, who quoted a Turkish proverb—"Fish always starts to rot at the head." The streak of sentimentality running through the leaders of the foundry industry is a guarantee that there will be no rotting due to a lack of appreciation of human relationships.

Contents

The Management Conference—II, 119.—Some Fundamental Problems in Foundry Planning, 121.—Preparation of Cast-iron Micro Specimens, 127.—Castings for High Temperatures, 128.—British Bathmaking Practice, 129.—British Blast Furnaces in the June Quarter, 1948, 134.—Work of the B.S.I., 134.—Engineering Wages Inquiry, 135.—Personal, 136.—Metallurgical Problems of the Services, 136.

Brinell Hardness Reader

A direct reading Brinell hardness number indicator has been developed by the Harry W. Dietert Company, of 9330, Roselawn Avenue, Detroit, 4, U.S.A. This unit is called Brinell Hardness Reader. It is constructed to fit conveniently into the grip of a person's hand. The dial of the unit is calibrated to read in Brinell hardness numbers. Two standard dial calibrations are available; one for the 10 mm. ball diameter with 3,000 kg. load and the other for the 10 mm. ball diameter with 500 kg. load. Brinell hardness readers with special dials for other ball diameters and loads are made to order.

The Brinell hardness impressions are made in the usual manner with a Brinell tester. The next step is to press the Brinell hardness reader against the piece under test so that the ball point of the reader enters the impression. The hand of the reader will point to the correct Brinell hardness number without the use of a conversion table.

The Brinell hardness reader is found exceptionally satisfactory for use in plants or laboratories where speed and accuracy are essential. The surface at the impression may be machined, rough ground, or left as cast. The accuracy obtained will be equivalent to that secured through the use of the conventional measuring microscope and conversion table.

Production Engineering Research Association

The third annual general meeting was held at the laboratories, Staveley Lodge, Melton Mowbray. Sir Lionel Kearns, C.B.E., presided. The research programme includes:—

(1) Performance of machine tools, including vibration tests, deflection tests, alignment tests, efficiency tests and production tests for roughing and finishing operations; (2) the effect of cutting fluids upon the efficiency of various machining operations, such as the turning, milling, grinding and drilling of various metals; (3) investigations on behalf of the Ministry of Supply into the machinability and formability of selected materials when subjected to various cutting and forming processes, and (4) private investigations as requested by individual members.

The official opening of the laboratories is to take place in October.

THE 1949 Foundry Congress of American Foundrymen's Society will be held in St. Louis, Mo., from May 2 to 5. There is to be no exhibition in connection with the Congress.

OVERSEAS VISITORS

Friday, October 1.—Works visits. Saturday, October 2.—a.m., Coach Tour of London; p.m., Steamer Trip on River Thames. Sunday, October 3.—Coach Tour to Windsor Castle. Monday, October 4 to October 7 or 8.—Tour of British Enamelling Works (to be arranged).

Institute of Vitreous Enamellers

International Congress and Annual Conference.

The First International Congress on Enamelling under the auspices of the Institute of Vitreous Enamellers, which is to be combined with the Annual Conference, will take place in London from September 27 to September 30, 1948, and visitors from overseas will be most cordially welcomed. Four important technical papers will be presented, and visits are being arranged during the Congress to two well-known works near London engaged on vitreous enamelling. Reports are to be given by the Sub-Committees who have been considering the welding of sheet metal for subsequent vitreous enamelling, and various methods of cleaning sheet iron prior to enamelling. Should the number of overseas visitors who are interested be sufficient, it is also proposed to organise, subsequent to the Congress, a tour through other British enamelling works.

Arrangements will be made for an interpreter to be present at all meetings so that overseas visitors who are not sufficiently conversant with the English language can take part in the deliberations. It may also be possible to arrange for an earphone interpretation of the lectures.

Hotel accommodation in London is very difficult to obtain, and early application to the Hon. Secretary, Mr. W. Thomas, F.R.I.C., Ebury Chambers, 74, High Street, Rickmansworth, Herts, is advised.

Conference Programme

MONDAY, SEPTEMBER 27

8.0 p.m.—Dinner to be given by President, Mr. R. J. Rogers, and Members of Council, to Overseas Visitors.

TUESDAY, SEPTEMBER 28

9.45 a.m.—Paper by Dr. Crussard (France), "Creep of Glass and Enamel at Fusing Temperatures."

11.30 a.m.—Report by Welding Sub-Committee.

1.0 p.m.—Luncheon.

2.30 p.m.—Works visit.

8.30 p.m.—Reception by President, Mr. R. J. Rogers; Supper Dance and Cabaret.

WEDNESDAY, SEPTEMBER 29

9.45 a.m.—Paper by Dr. Stevels (Holland), "Some Chemical Aspects of Colour and Opacification of Vitreous Enamels."

11.30 a.m.—Paper from the U.S.A. to be read by Mr. W. Astles, "Lithium in Enamels."

1.0 p.m.—Luncheon.

2.30 p.m.—Works visit.

6.30 p.m.—Visit to theatre.

THURSDAY, SEPTEMBER 30

10.0 a.m.—Annual General Meeting.

10.30 a.m.—Induction of new President and Presidential Address.

11.15 a.m.—Report by Sheet Iron Cleaning Sub-Committee.

1.0 p.m.—Luncheon.

2.30 p.m.—Paper by Dr. J. H. Partridge, "Some Physical Considerations of Vitreous Enamelling."

7.30 p.m.—Reception by new President, Dr. H. W. Webb. Banquet.

9.0-12.0 p.m.—Dancing or entertainment.

(*Continued at foot of col.* 1.)

Some Fundamental Problems in Foundry Planning*

Stresses the practical relationships involved

By Jorgen Drachmann†

As far as the Author knows, this subject has not been treated at an annual conference before. Nobody working in the foundry could really deny that in the daily routine the planning and progressing play an important part. With a sound and practical system run by an enlightened progressing department, much time and trouble are saved for the foremen, the management and, what is more important, the customers.

Moreover, many authors have, when discussing foundry management, treated the subject in one or more chapters, but they have mostly tried to describe one complete system covering all possible sorts and conditions of foundry work which, in the first place, is hardly a practical proposition and, in the second, so scares the foundry manager who contemplates introducing a system of planning in his own particular foundry, that he dares not even try.

The object of this Paper is, therefore, not so much to describe any special system as to try to break up the problem into its vital components and then propose a solution to each of them and thereby let the managers themselves decide how much of the information is of any use in their special case.

Relation between Planning, Sales and Directorate

Before going into the various technical problems to solve, there are, however, two personal problems in every attempt to run a planning department which are of such a major importance that they must be solved before all others. The first is that of the managing director and the other that of the sales department. If the managing director has sanctioned the introduction of a planning department, he should draw the logical inference and let it do the work without disturbing it every time an old customer or a business friend telephones him and demands a shorter time of delivery.

The same point of view may be applied on the selling department. If the foundry is fully planned for some months ahead, the time of delivery for a new order is probably the same months plus the time to do the work in question. That should be the normal rule. Neither the managing director nor the sales department should allow themselves to break that rule, but with the sole exception that they may induce the customer—or another customer—to agree to their prolonging the time of delivery on other similar work from the foundry point of view.

The quite normal tactics of the director to promise the customers the earth and then leave the planning departments with all the consequent trouble is poor company policy towards the customers and psychologically detrimental to the internal relations. In the long run, it is both more honourable and easier to promise the customer to answer him next day and then forward the question to the foundry manager: "Mr. —— has telephoned me to ask if we could deliver his order number so-and-so. Please tell me to-morrow under what conditions that is possible." The foundry manager consults the planning scheme, examines the order and then goes backwards in time to see if the same customer has other work planned on the same groups of machines or what else is in the way. He then puts the whole problem before the director: If the customer is willing to postpone the earlier order to a specified later date, the foundry would be able to help him with this, or if the foundry's own machine shop could manage without their order for some weeks—and so on. Either the customer or the director or the sales department, as the case may be, has then only to make the decision and then stick to it, but the planning department ought never to take any responsibility in the business.

As a foundry manager, the Author has had hundreds of customers' requests to treat in this manner and never encountered any trouble with them, when he explained the method outlined here to their buying department, and, when the buyers first had grasped the principle, they usually prepared the matter themselves by having decided beforehand what other order they could postpone. It is the hope of the Author that every man in a leading position who reads this will understand that, no matter how highly organised in a technical sense his planning department is, it stands or falls with this principle of loyalty in his own handling of the basis for its work.

The Case of the "Tied" Foundry

The planning for a foundry making a limited number of products for its own machine shop at an approximately constant rate of production may seem a very synthetic foundry initially. On inspection, however, most foundries attached to machine shops have some standard products running all the time and in the present seller's market, the stock of undelivered orders usually covers one or more years of production, so that the rate of delivery is the same as the full rate of production—that is, approximately constant.

It is therefore neither too pedantic nor unreasonable to consider the problems of this special part of the ordinary foundry's work as those of a separate foundry working under these conditions.

There are two main technical principles of planning which must be followed in any attempt to make an

D

*Presented at the London Conference of the Institute of British Foundrymen, June, 1948.

†The Author is Vice-Managing Director of A/B Svenska, Strebelverken, Vastervik, Sweden.

Problems in Foundry Planning

effective planning system. They are:—(1) the principle of total load, and (2) the principle of margin. The first means that, whatever system be adopted, the total load of orders on each product must be taken into account somewhere in the system. It is a common fault when orders are streaming in, far beyond the possibilities of delivery, to plan both production and deliveries only for a certain time to come. If one does that, the terms of delivery beyond that period cannot be anything but guesswork and the management is certain to run into trouble sooner or later.

The second means that, however exact the system be, however accurately it takes every factor of the production into account, one can never be absolutely sure that the calculations for the future are going to agree with realities. Therefore, it is essential to plan with a certain allowance for unexpected circumstances. Whether a free margin be kept on capacity when loading the different departments or machine groups or whether one uses a certain percentage of security on the terms of delivery from the selling department does not really matter. The main point is that it must be somewhere in the system. To illustrate these two points and at the same time give a very simple example of how to plan a foundry of the type of production indicated, the following is a description of the planning system of *A/B Svenska Strebelverken.*

A Practical Example

Apart from the problem of spare parts, which is to be described later, the production of that firm consists of six different sizes of cast-iron boilers for domestic space heating. Each boiler is constructed of sections of varying quantities, according to the heating surface, and small parts for grids, doors and the like. The works are situated in Vastervik and the selling department in Stockholm.

The planning of the production is exceedingly simple. Once a week there is a planning conference composed of the despatch clerk, the machine-shop foreman, the light components foundry foreman and the Author. The programme consists of three major items:—First, the previous week's deliveries in tons are entered on a chart kept by the Author on which a red line shows the predetermined tonnage from the beginning of the year. Next, the possible delays in comparison with previous plans are discussed and, finally, the deliveries during one week, four weeks ahead, are determined. In order to do that the machine-shop foreman has counted his current stock of components and assessed the present position as to labour available, delays or deliveries ahead of schedule. The result is a short list specifying how many of each of the six types the works deems itself capable of delivering during the particular week. This list is posted to the Stockholm office and by return of post a corresponding specification of order numbers is sent to the works. Out of the existing stock of orders the works copies of these are given to the machine-shop foreman, who now has four complete weeks' deliveries planned before him. That is sufficient time to enable him to run the machine shop on reasonably economic lines and he has not more "paper" than he is able to cope with without losing himself in a red-tape entanglement. According to his stock of sections and the types of boilers to be delivered, he plans the boiler section foundry and the light component production in co-operation with the respective foundry foremen and, if nothing serious happens, everything goes smoothly.

As will be seen by this description, neither the principle of total load nor that of margin is followed at the works. They must therefore of a necessity be taken cognisance of by the sales department. As a basis for the terms of delivery on each new order, this department has a statistically determined list of deliveries per month of each type of boiler. This is based on actual numbers, but as a margin, 10 per cent. is deducted and the time of delivery for a new order is calculated simply by dividing the stock of undelivered orders of the same type of boiler by the corresponding reduced number of monthly deliveries. Thus, though the actual planning of the works is only made up for four weeks, both the principle of total load and of margin is followed in the relation to the customers. This remarkably simple system has by now been in operation for about two years to the complete satisfaction of the customers, the sales department and the works.

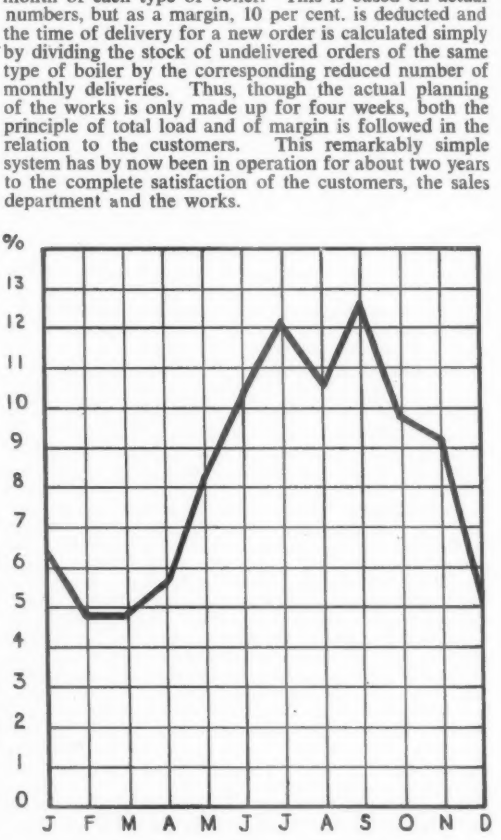


FIG. 1.—SEASONAL VARIATION OF ONE BOILER MODEL COMPUTED AS THE AVERAGE OF THE YEARS 1936-44. THE ORDINATE IS THE PERCENTAGE OF THE YEAR'S TOTAL, THE ABSCISSA THE MONTHS.

Planning for Seasonal Variations

In times more approaching normal than the present, it is usually the selling which regulates the production and not *vice versa*. When the demand for a certain foundry product varies with the season, the foundry in question is confronted with the problem of having for some months more capacity than work and for others more work than capacity. As it is usually undesirable to dismiss labour to a greater extent during the slack period and re-engage it during the busy season—partly because of the social aspect of it and partly because good men will seek better work elsewhere—it is up to the management and notably the planning department to solve the problem of seasonal variation by working for stock during the slack period, and selling from stock during the busy season.

In such work, naturally much depends on the degree of seasonal variation of the products in question. Lawn mowers are typical of the highest degree of seasonal variation in Sweden, as more than 90 per cent. are sold during the months of May and June. At the works of *Norrahaumars Bruk* the total quantity of 25,000 to 30,000 lawn mowers was put into a planning programme once a year, usually in July or the first week of August, when the season was over and the stock of unsold mowers could be taken into account. Most

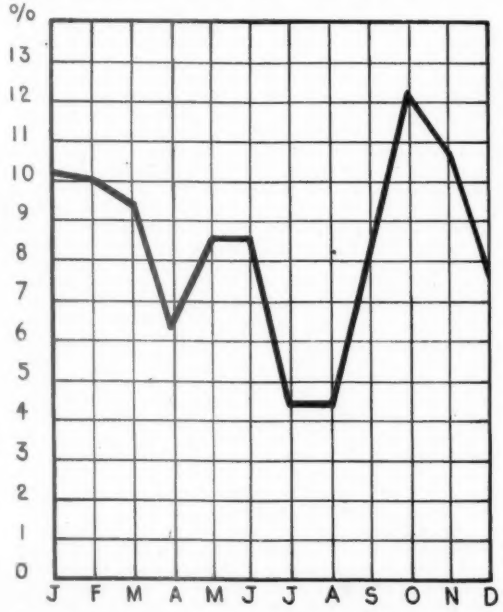


FIG. 2.—SEASONAL VARIATION OF THE SAME BOILER MODEL AS IN FIG. 1 COMPUTED AS THE AVERAGE OF THE YEARS 1946-47.

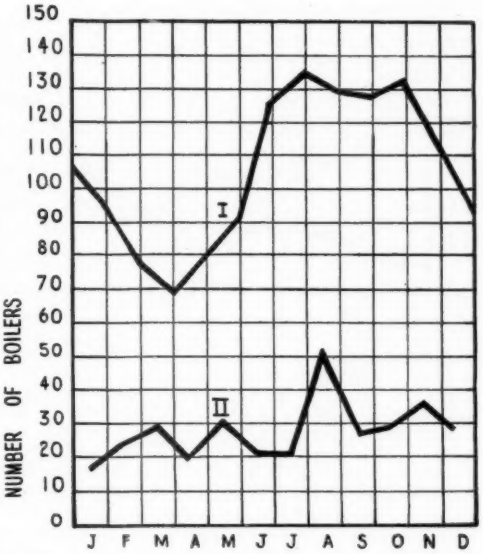


FIG. 3.—GRAPH I IS THE STOCK OF UNDELIVERED ORDERS OF ONE BOILER MODEL THE FIRST OF EACH MONTH 1947. OBSERVE BY THE SIMILARITY TO FIG. 1 HOW THE SEASONAL VARIATION HAS BEEN TRANSFERRED FROM THE DELIVERIES TO THE STOCK OF UNDELIVERED ORDERS, BECAUSE THE FOUNDRY HAS BEEN WORKING TO FULL CAPACITY DURING THE WHOLE TIME. CURVE II IS OF DELIVERIES OF THE SAME BOILER EACH MONTH. NO SEASONAL VARIATION IS TO BE NOTED FOR THE SAME REASON.

building materials such as boilers, stoves, kitchen ranges and the like are more or less subject to seasonal variations, partly because building in itself varies, partly because maintenance or change of heating apparatus preferably is made in summertime.

The first move, when starting a planning department, is to make statistics on as many previous years' selling and production as possible, month after month. Take a large paper and let the months be the abscissa and the years the ordinate. Then fill in all the monthly deliveries of the same products and add them up both in the horizontal and the vertical direction. Horizontally the figures give the total for each year and vertically the total for each month. Then, when both are added it yields the grand total of both directions and so checks that the additions are correct. Divide the monthly sums by the grand total and multiply by 100 and it gives the percentage delivered each month of the year. By doing this for each product there is provided a sound foundation for planning. Fig. 1 shows a percentage curve for one model of *Strebelverken's* boilers

Problems in Foundry Planning

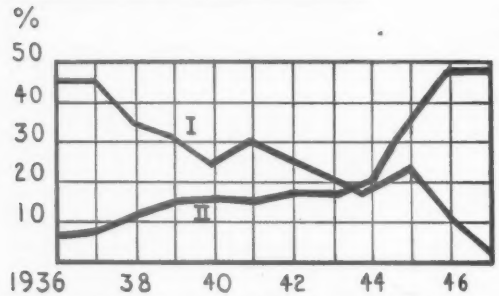


FIG. 4.—GRAPH I IS THE PERCENTAGE OF THE THREE SMALLEST MODELS OF BOILERS TO THE TOTAL NUMBER OF BOILERS 1936-47. GRAPH II IS THE SAME FOR A NEW MODEL OF SMALL BOILER COVERING ABOUT THE SAME RANGE OF HEATING SURFACE. NOTE HOW THE NEW BOILER STRANGLES THE OLDER TYPES.

computed as an average of nine years' deliveries, 1936 to 1944. It is quite typical for this type of product.

Danger of Using Abnormal Data

Here a word of warning may be appropriate, because the assembly of statistics without a very critical attitude as to their soundness is an extremely dangerour pastime. Care is needed, therefore, to ensure that the years chosen are normal or the statistics will be worse than useless. As an example, Fig. 2 shows the percentage curve of the last two years—1946 and 1947—of the same type of boiler. During these two years the average stock of undelivered orders has been about six months and the curve only shows that production has varied. The reason for the downward trend in July and August is partly due to the annual holidays and partly to the difficulty to persuade the workers to stay in the foundry during the hot season; it has nothing whatever to do with the ordinary seasonal variation. Of course, no real good could come out of adding these two years to the rest in order to extend the statistics. The same reasoning excludes 1945 because of a five months' strike in the foundry industry. To show that seasonal variation really exists also when the planning is done on a production basis—that is when the stock of undelivered orders allows deliveries according to full capacity all the time—Fig. 3, Graph I, shows the stock of undelivered orders for one model of boiler from *Strebelverken*. The likeness to the percentage curve on Fig. 1 is most striking. The lower graph II shows the deliveries of the same boiler during the same period. Although it certainly shows variations, they are not to any appreciable extent, correlated with the normal season.

Planning from Sales Forecast

Besides the monthly percentage, these statistics give much other information of value. They give, in summary, the estimate for each year and, by taking the percentage of each model of the total number sold each year, the trend of each model. The latter information is useful when it is a question of forecasting the future sales of a certain model. Fig. 4, Graph I, shows the sales of the three smallest models taken together, and II a comparatively new boiler of about the same size. While the proportion of small boilers to the total is approximately constant, the new boiler is successively ousting the three older models until they were definitely killed by the stopping of the sales in 1947.

Armed with this material the planning department goes to the sales department, preferably when the busy season is just over, and asks for information about the sales during the next year of production. If the salesmen say that they do not know—which is quite likely—it is necessary to inform them that it is their job to know or guess, whichever they like, because it is not the planning department's responsibility to forecast the selling, but merely to plan the production according to the salesmen's statements. After some time a list containing the number for each type is probably agreed upon and sent to the planners.

Loading of Production Groups

Their first job then is, with the help of the components lists, to break down each type into the corresponding number of castings, divide the castings according to the production groups: groups of hand moulders, groups of similar machines, coreshop, etc., and load them on to the groups according to their piece rate. If the capacity, in direct wages, which could be reserved for this part of the whole production, is sufficient to cover the total load on each group, when proper consideration is taken of the allowances for wasters, etc., it is satisfactory, but if the total load is too great, the list will have to be revised. The test of the total load, however, is not sufficient to guarantee that it is possible to produce the list. There is also the test of the key castings to consider. The key castings usually are the largest castings of each type of product —though it may be the smaller castings going into several models of boilers in a greater number in one—which puts a limit to the production, because the available plant only allows a certain quantity to be cast per week. If a works produces lathes and it can only with the one pattern make one bed a day, it is hardly advisable to count on making more than 250 lathes a year, although the whole shop has got sufficient capacity for making double the amount measured in direct wages. Consequently the planning department must, of necessity, weigh the list according to the possibility of producing the key castings. All this sounds like excessive work but in reality if the planners know their job, they will be able to tell practically at a glance where the difficulties are likely to arise.

When the list is revised and finally sanctioned by both selling and planning department as to the total quantities, extensions of pattern gear decided on, if necessary, *etc.*, the planning department takes the list and starts planning. First the total number of each model is broken down in proportion to the percentage curve which gives the forecast of the deliveries for each month. Then with due regard to summer holidays and Christmas,

each month is loaded with an approximately equal number of key castings per week and the smaller castings divided up according to an appropriate plan and correlated with the programme of the machine shop. On the whole, of course, the machining time, which in extreme cases may be a couple of months, must be taken into consideration, but it is outside the scope of this paper to discuss that question.

The manner in which the loading and progressing is done in the foundry has not been mentioned and is really of no importance. It is sufficient to suppose that some effective system is used. With the production and the deliveries defined each monh, it is easy to calculate the accumulated stock of key castings which ought to be available at the end of each month. How many of the castings for each model, it is reasonable to consider as key castings is dependent on their size and value. The small castings may be produced for stock and ordered on a stock requisition basis, which case is treated in the next section.

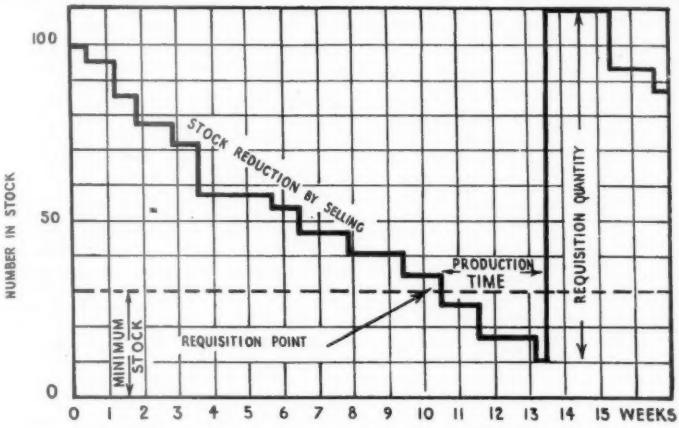


FIG. 5.—FUNCTION OF THE ORDINARY STOCK REQUISITION SYSTEM. NOTE HOW THE PRODUCTION TIME ALLOWANCE IS DETERMINED BY THE TREND OF STOCK REDUCTION AND THE MINIMUM STOCK TOGETHER.

Monthly Assessment

All this sounds very logical and seems to cover all necessary items in the planning of a season-varying production but there is one great question mark in it and that is: what happens if the sales department's guess is not correct? It was in order to answer this question that the available stock was calculated. On the last day of each month, the planning department makes a report showing for each key casting:—(1) Castings in stock (*a*) in the fettling shop; (*b*) raw castings in stock; (*c*) in the machine shop; and (*d*) in finished products; (2) castings which should be available according to plan; and (3) castings reserved for existing orders

By subtracting the reserved castings from stock and comparing the existing stock with scheduled production, it is easy to determine whether output is or is not as planned. If the different models be interchangeable in production, and it is only a question of one going faster and another slower than calculated, it is usually easy to alter the planning accordingly, but if all models are selling faster than expected it may be rather difficult to manage and the selling department may be compelled to prolong the time of delivery.

A close co-operation between the sales department, the machine shop and foundry planning departments is, of course, essential all the time, and this co-operation should be strongly backed up by all concerned, especially the managing director, who by incautiously favouring the sales department against the works and issuing imperative orders without troubling about realities may easily upset the rather delicate balance of it all.

Planning of Stock Requisitions

In normal times it is usual for foundries, especially those making light castings for the building trade, to sell a great part of their products from stock. Seen from the planner's point of view, that means that he never has anything to do with the customers' orders because the stock is placed as a buffer between the sales and the production departments. The organisation is very simple. For each product a stock card is kept on which all movements of the quantity in stock are carefully entered. Besides the ordinary information as to type, etc., of product, the card contains two important items: minimum stock or requisition point and quantity to be requisitioned when this point is reached. The clerk who is responsible for the stock cards merely enters all deliveries to customers, calculates the balance and when that equals the requisition point he issues an order for the quantity specified on the card. Fig. 5 shows the nature of the proceedings.

At the time zero there is a normal maximum quantity of 100 castings in stock. By successive deliveries this is reduced until there is, in the 10th week, only 30 left. As 30 is the minimum stock, a requisition for 100 pieces is issued and three weeks later the stock is filled up again. During the three weeks, 20 more pieces have been sold, but there has been no break in the deliveries as there has been a quantity in stock all the time.

It must be admitted that it looks satisfactory. It is a nice automatic system, well taking care of the inevitable variations of selling, whether of the seasonal or random type. Especially for spare parts to models gone out of production, it really is an excellent system, be-

Problems in Foundry Planning

cause as long as nothing is sold, one need not bother about it, but when the requisition point is reached an order is received of a quantity making it worth while to get out the patterns, boxes, etc. It is a good plan to go through the quantities delivered once a year and make the necessary corrections of both requisition point and quantity, especially as older types of spare parts are apt to die slowly. If stocks are not cut down in time, there is always the risk of being stranded with spare parts for a hundred years to come.

For current production, however, the method is inherently dangerous. It works well enough in a small way when one is working from hand to mouth on customers' orders, but when the selling is easy and there are a quantity of undelivered orders in stock, it creates difficulties. Referring once more to Fig. 5 it will be noted that between the requisition point and the time when stock is replenished there is an interval designated "production time," which should not exceed the time it takes to sell the minimum stock. When sales increase, the line or curve of stock reduction becomes steeper and the "production time" on the stock card becomes shorter. In reality, however, in the foundry the production time, which includes the time during which the foundry is already fully loaded, increases. In short, one's pet automatic system is working in the wrong direction. The difficulty is that one cannot work a system where one carefully observes the principle of total load and bases promises on that, and then there are a quantity of orders "popping out" on stock requisitions with times of delivery fixed beforehand. The two systems do not agree.

Alternative Methods

There are, however, several ways out of the difficulty—depending on the proportion of production for stock to the total. If this proportion be small, it is possible to increase the safety margin in the planning so as to include the production for stock. Instead of loading the different production groups to say 90 per cent. of normal capacity, cut down the loading to 80 per cent. and base future promises of delivery on that. This extra 10 per cent. margin may be used to get out castings for stock. If the stock requisitions come in bunches at uneven intervals, there is, of course, no arrest in production, but some other orders are in the meantime merely put into production earlier than expected. Luckily, customers usually do not get half as angry when they get the goods a few weeks earlier as when they get them some time later than promised.

If the proportion of production for stock is so great that this method is impracticable and the average load, although greater than assumed, when the minimum stocks were fixed, is tolerably constant, both minimum stock and requisition quantity may be increased to meet the prolonged production times.

When the situation goes quite out of hand, however, and the average load reaches a year or more, the stock requisition system is unworkable, and it is better to base the orders for stock on a budget, which, of course, ought to cover approximately a period equal to the average load of the foundry.

Planning of Jobbing Orders

While the foregoing sections all have treated questions concerning their own production, this one is intended to deal with jobbing orders. The author has speculated somewhat on how to define a "jobbing job" against an "own job." From a planning point of view, it seems that it is characteristic of the "jobbing job" that, unless some special agreement to the contrary exists, the foundry cannot be held responsible for more than the orders it really has accepted. It is the customer's affair to secure the continuity of his supply of castings by placing orders for appropriate quantities at the right time.

Usually the jobbing order begins its life as an inquiry. Assuming that it concerns a new casting, a complete estimate, including the pattern, is necessary. The next question is that of delivery. The planning department knows the load on the pattern shop as well as on the group in the foundry where the casting is produced, so it is fairly easy to determine an estimated time of delivery to go with the quotation. It is important that the customer really understands that it is impossible to *promise* a delivery, when quoting for a casting, as it is not known how long the customer himself needs to decide if he wants the firm quoting to produce the casting. If it takes a month from the receipt of the quotation until he sends the order, the load on the foundry may have changed from three weeks to three months. With inquiries arriving every day, out of which only 10-20 per cent. may ever become orders, one cannot keep on loading the foundry with 80 per cent. imaginary orders in order to be absolutely sure that one is always able to keep a preliminary estimate of delivery.

It is only when the order arrives that a definite time of delivery is decided on, and at the same time the order is loaded on the pattern shop and foundry. A new delivery time is communicated to the customer when the order is confirmed. With a new pattern, it is usually good practice to send the first casting off the pattern to the customer for approval. Much money has been saved by foundries following this system. From the planner's point of view it introduces a small difficulty, as the customer is not always so very expeditious when it comes to the control and approval. Especially in the case of large customers, these pilot castings arriving simultaneously with ordinary deliveries are apt to get lost on their way to the control department. In order to get the upper hand in the ensuing trouble, the planning department ought never to promise a definite date of delivery, but invariably so and so many weeks after approval of a sample casting. In repetition work, this precaution is, of course, unnecessary. When the customer supplies the pattern, the responsibility for faulty castings due to pattern defects lies with the customer himself, but nevertheless the Author prefers to send a sample casting. It has happened that the customer receiving the first batch off an old pattern did not recognise the castings as belonging to his production at all. The explanation was simply that the pattern had been

transferred from another foundry, whose pattern storekeeper had made a mistake, and sent another customer's pattern. As the identification numbers were the same on the two patterns, nobody had bothered about getting out the drawing. The rest may be left to the imagination.

Conclusions

The Author has tried to show some of the main problems in foundry planning. As it is not possible to give a standard plan covering all sorts of foundry work, the subject had been divided in the following sections:—(1) The planning of a few products produced at an approximately constant rate; (2) the planning of products subject to seasonal variation; (3) the planning of products to be sold from stock, and (4) the planning of jobbing orders.

In each case the Author has shown how to apply the two main principles, namely:—

(1) *The principle of total load,* which means that a planning system never can work well, if somewhere in the system the total load of orders is not taken into account. If this principle is not followed the promises of future deliveries must be mere guesswork.

(2) *The principle of margin,* which means that, however well the foundations of the system are in accordance with the work, a certain allowance for unexpected troubles like illness, absenteeism, shortage of material, *etc.*, must be taken into account if delivery times are to be kept.

Throughout the whole Paper, the Author has preferred to keep absolutely neutral as to the question of paper routine and progressing systems.

The Planning of a Real Foundry

Hitherto no appreciable notice has been taken of the fact that usually a real foundry contains work of more than one of the different categories described in the four sections above. A large foundry attached to an engineering firm easily may have to cope with all four sorts of work, that is, some of its products may be sold to the full capacity of the foundry, others may be subject to seasonal variations, others again, *e.g.*, spare parts, may be ordered on stock requisitions, and a fair percentage of jobbing work may be thrown in with the rest.

To manage the planning and progressing of such a foundry, of course, a fair amount of paper routine is inevitable; also a good workable system of loading and progressing must be used. But after all, the real problem is to find the right man for the job. If the planning department has been long established and is working well, it may be good practice to recruit planners from the ratefixers. They have the advantage of knowing the paper routine, the prices, and, to a certain extent also, the moulder's individual capacity. Pay the planners better than the ratefixers and let it be a promotion. Also, a good machine-moulder, showing a head for arithmetic, may be useful. He knows both the work and the men intimately. In this respect it may be worth noticing whom of the younger machine moulders always calculates the wages due to him beforehand.

If it is the question of starting a planning department, it is far more difficult. Besides the technical problems, numerous personal problems are apt to emerge as many foundry foremen consider it their prerogative to plan their own departments. If a time-study man is available and could be spared for a time, it may work. He usually has some authority over the foremen and is indeed used to personal troubles. If possible it is best to get him into the planning department of another foundry for a couple of months and then to start on a small scale, on his return. Take one group of ten to twenty moulders and plan and progress them for some months. Then let him teach an assistant to do that and rope in the next group, and so on. Support him strongly against the sales department from the very first, as it is the natural enemy of law and order in the planning department.

At this phase, there is no need to bother too much about the finer points of seasonal variation, stock requisitions and the like. These problems will find their solution in the natural course of things. The main point is to hold on to the principle that all orders, whether for own production or of the jobbing variety, when they are accepted, confirmed, and a delivery promised, must be treated alike, and if the general manager wants one sort of casting delivered at short notice, he must be prepared to accept a delay of some other sort. Stormy scenes are most likely to occur, but if the planning department survives, a discussion on a base of realities will be the eventual outcome. Then some of the suggestions detailed in the four preceding sections with appropriate local finishing touches may be of some value.

Preparation of Cast-iron Micro-Specimens

The committee on cast iron microstructure of the American Foundrymen's Society has begun the preparation of a comprehensive survey of metallographic techniques for cast iron now in general use, to be released as a series of reports. Aim of the reports is to provide industrial laboratories with detailed information through which to obtain the most satisfactory results in the inspection of iron microstructures.

The first report will consist of four sections, each covering a phase of metallographic procedure; introduction, including general background, cutting and mounting; grinding, polishing and etching; photomicrography, developing and printing; and special "tricks of the trade." According to the committee, it is generally agreed that metallographic techniques for cast iron are still in the class of an art, with success in polishing depending largely upon the skill of the operator. Excellent results have been obtained by operators using widely differing methods, while a number of operators using the same general method may obtain very good or very poor results.

Castings for High Temperatures

Proposed American Tentative Specifications for Grey Iron Castings for elevated temperatures for non-pressure containing parts.[1] *American Society for Testing Materials Designation:* A 00 — 48T.

Tentative Specifications have been approved by the sponsoring committee and accepted by the Society in accordance with established procedures, for use pending adoption as standard. Suggestions for revisions should be addressed to the Society at 1916 Race St., Philadelphia 3, Pa, U.S.A.

These specifications are general, covering cast irons normally used for the above types of service, at temperatures as high as 760 deg. C. It is not intended to imply that all three classes are suitable throughout this entire temperature range without regard to actual service stresses. Some are suitable for long service at the lower temperatures only, unless low stresses are involved.

Scope

(1) (*a*) The specifications cover three classes of grey iron suitable for castings exposed to temperatures encountered in such service as grate bars, stoker links, stoker parts, oil-still furnace parts, firebox parts, ingot moulds, glass moulds, caustic pots and metal melting pots.

(*b*) The three classes of grey iron covered by these specifications are as follow:—

Class I, possessing superior resistance to thermal shock;

Class II, possessing average resistance to thermal shock and a moderately good tensile strength (tensile strengths above 13 ton per sq. in. may be expected); and

Class III, possessing a higher tensile strength than either classes I or II (tensile strengths as high as 17.8 tons per sq. in. may be expected).

Manufacture

2. The melting procedure shall be optional with the foundry.

Physical Tests

3. Some of the grey cast irons described in these specifications are deliberately made of a soft, low-strength iron for resistance to thermal shock, and strength requirements are unnecessary. For applications in which a strength requirement is essential, room temperature tensile strengths may be specified up to those prescribed for class 40 in the Standard Specifications for Grey Iron Castings (A.S.T.M. Designation: A 48).[2]

Machinability

4. All machinable castings shall be limited in hardness at such locations on the castings as designated by the purchaser. The maximum hardness at the locations on castings that are to be machined shall be a matter of agreement between the manufacturer and the purchaser.

Chemical Composition

5. (*a*) It is the intention of these specifications to classify these irons in accordance with their carbon content equivalent calculated as follows:—

Carbon content equivalent = C + 0.3 (Si + P).

(*b*) The carbon content equivalent and the minimum carbon content for the various classes shall be as prescribed in Table I. Table II prescribes the allowable silicon ranges predicated on the basis of various permissible carbon contents. It is recommended that embrittling impurities be held to the following maximum limits:—

TABLE I.—*Chemical Requirements.*

Class	Carbon content equivalent	Carbon min., per cent.
I	3.81 to 4.40	3.50
II	3.51 to 4.10	3.20
III	3.20 to 3.80	2.80

Phosphorus, maximum, per cent.	0.60
Sulphur, maximum, per cent.	0.12

(*c*) The three basic classes may be alloyed with chromium. When chromium is present as an alloying element, each class shall be subdivided into types designated as follows:—

Type	Chromium, per cent.
A	0.20 to 0.40
B	0.41 to 0.65
C	0.66 to 0.95
D	0.96 to 1.20

(*d*) All irons may be alloyed to increase the strength and to improve and stabilise the structure for elevated temperature service. The alloying elements which in addition to chromium are commonly added to improve these properties are copper, molybdenum, nickel, and vanadium. Any combination of these alloying elements which assists in resisting oxidation or surface deterioration or in stabilising the structure or retaining strength at elevated temperatures, may be used.

TABLE II.—*Variations in Carbon and Silicon contents.*

Class	Carbon, per cent.	Silicon, per cent.
I	3.50	0.90 to 2.70
	3.70	0.90 to 2.10
	3.90	0.90 to 1.50
II	3.20	0.90 to 2.70
	3.40	0.90 to 2.10
	3.50	1.80 max.
III	2.80	1.20 to 2.70
	3.00	0.60 to 2.40
	3.20	0.60 to 1.80

The provisions of these specifications permit the purchaser to select a grade of cast iron suitable for his service and to define the product, as, for example:

Castings class II, type B, plus —— alloys. All surfaces marked "f" (for finish) with BHN 250, maximum.

The specification concludes with the usual paragraphs on "check analysis"; "workmanship and finish"; "inspection"; "rejection" (which states that failure to meet check analyses, or physical tests when required, shall be sufficient cause); and "certification."

REFERENCES.

1 Under the standardisation procedure of the Society, these specifications are under the jurisdiction of the A.S.T.M. Committee A-3 on Cast Iron.

2 1946 Book of A.S.T.M. Standards, Part I-B.

British Bathmaking Practice

Amenities at Greenford Foundry

At the London Conference of the Institute of British Foundrymen, Mr. A. Young, of British Bath Company, Limited (one of the Allied Ironfounders, Limited, Group of Companies), presented a film showing the methods used at Greenford for the quantity production of baths. Mr. Young, in introducing the film, prefaced his commentary by general remarks about the establishment at Greenford, and said that the history of the development of baths from early Roman types to the present day standards has been very adequately covered by eminent experts, and for the present purpose, historical references of that nature were superfluous.

Production Story

As he had had 20 years' association with the company which made the first sustained attempt at mass production of cast iron porcelain enamelled baths on a one-purpose plant in this country, it was proposed to deal with the subject, more or less, in the form of a production story. Twenty years ago the original directors of Light Castings, Limited, who developed the scheme of making cast iron baths on a specialised plant in the London area, displayed considerable courage and vision in deciding on the Sandslinger as the vehicle of production.

By 1928 many of the established and more progressive bath manufacturers had experimented with the Sandslinger in its early form, *viz.*, the tractor type. Practically every attempt to make baths by tractor Sandslinger was abandoned for a variety of reasons, and manufacture in this country generally had reverted to the older and established hand moulding methods by the time the plant at Greenford was installed late in the year 1928. No doubt one of the main reasons for discarding the Sandslinger, or rather failing to persevere with it, was the plentiful labour supply.

Around the established foundries where baths were made, there was always an adequate force of seasoned labour available, and although hand ramming bath moulds was hard work, men were always willing to tackle it. Moreover, bath moulders at that period regarded themselves as craftsmen and were reluctant to adopt new methods. Arising from the disappointing experience of their rather hesitant and tentative attempts to make baths by new methods, no doubt the average bath maker at that time was satisfied that he could produce baths as effectively and as cheaply by the older and established methods. The reaction of labour generally was not particularly favourable to moulding by machine ramming, and the initial ex-

FIG. 1.—GROUP OF SHOWER CUBICLES AND WASH HAND-BASINS

British Bathmaking Practice

perience of operating the machines had been unsatisfactory mechanically.

Establishment of Greenford

At Greenford there was no reserve of seasoned labour and no alternative method of manufacture ready to hand, so the management had to adapt the Sandslinger to the job and the project was tackled from the outset in this spirit. A nucleus of about 20 young men who had been engaged on hand ramming of bath castings on the block system was brought from Falkirk at the end of 1928, and the remainder of the ancillary labour was recruited locally. Because of the depression in South Wales and on the North East Coast, large numbers of young men made their way to London from these areas, and young men of this very desirable type constituted the bulk of such subsidiary labour.

There was not a single skiled moulder in the production squads manning the machines, etc., and although the supervisory staff was recruited from men with long experience of floor moulding, *etc.*, the fact that the labour force had no preconceived ideas about methods of making baths, etc., was all in their favour, as these men appreciated that their own prospects of continuity of employment depended upon the success of the Sandslinger project. Naturally, there was a certain amount of labour turnover in the early stages, but generally the workers adapted themselves to the new methods satisfactorily, and in due course became efficient machine moulders.

From 1929 the management finally built up an output of approximately 500 baths per week based on the tractor-type Sandslingers.

Sand-handling Bottleneck

In the light of the present output of more than 2,000 baths per week, the 1929 output seems negligible, but it is worth recalling that in those days there was no sand-handling equipment and that the sand heaps had to be reconditioned by the old rule-of-thumb methods. This state of affairs did not facilitate production, and the quality of the castings suffered accordingly.

Fortunately, Mr. Muirhead, the works director, had the inspiration to adapt an old tractor machine as a sand cutting machine and aerator. This machine crawled along the sand heaps after the shakeout and enabled the foundry to make its first attempt at continuous moulding. Gradually the output from the tractor machines was increased to a figure around 700 baths per week by improved technique, but it was recognised that the management could not produce the output sought, namely, 1,000 baths per week in the existing plant.

The facilities for controlling the reconditioning of the sand and for plant maintenance were not all that

FIG. 2.—LOCKER ACCOMMODATION AT THE GREENFORD WORKS

FIG. 3.—DRYING ROOM, SHOWING HEATED RAILS AND WIRE RACKS FOR CLOTHES

could be desired for the production of satisfactory bath castings. It was therefore decided in 1932 that in order to achieve the desired production it would be necessary to undertake a complete reorganisation of the whole plant. This reorganisation included the installation of three stationary Sandslingers with the appropriate sand preparation and sand-handling plant.

Reorganisation with Stationary Sandslingers

The changeover was gradual after the first stationary unit became available, and the tractor machines were kept in production for about three years, covering the completion of the installation and the running-in period of the new stationary machines and ancillary plant.

As it was necessary to maintain output, the changeover from the tractor to the stationary machines was quite a formidable operation and could only be accomplished gradually. It was completed early in 1936, and by June, 1936, the factory was producing baths at the rate of approximately 2,000 per week from the three stationary machines.

Concurrently with the plant reorganisation during 1933, a revolutionary step in bath manufacture, *viz.*, a double shift in the foundry, was undertaken, because of the need to increase output. There was a fairly lengthy "trial and error" period when the double shift was inaugurated, and many mistakes had to be put right gradually, notably that of splitting the teams, i.e., teaming 50 per cent. fresh labour with 50 per cent. of the established labour in the various production squads. This method was adopted in the hope that the trained men would offset the lack of experience on the part of the beginners.

These hopes were not realised, and very soon the conclusion was reached that it would be better to retain one efficient shift and start up the second shift with completely raw labour on the machines.

Adaptation of Buildings to Plant

The buildings were originally designed to accommodate an output of 1,000 baths per week from the tractor machines. To accommodate an output of over 2,000 baths per week required a certain degree of improvisation, particularly in the handling and storage of raw materials. Had the designers of the buildings anticipated the installation of sandhandling equipment, stationary Sandslingers, etc., they would undoubtedly have provided shops with greater height, which would have had the effect of making the crane operation less crowded and facilitated the use of more modern pouring methods.

By 1939 the plant was running very efficiently and effectively, but like many other foundries engaged in making components for the building industry, the management was obliged to switch its activities to other products before the end of that year. Towards the end of 1939 the foundry was making mine sinker castings on the old tractor machines, and during the years that followed a wide variety of castings were made on the stationary plant, including mortar bombs, brake drums, etc. The vitreous enamelling plant was removed, and machine shops, varnishing stoves, etc., were set up.

Late in November, 1944, the author was invited to a M.O.S. conference with Mr. Makemson, who was at that time Director of Iron Castings at the Ministry

British Bathmaking Practice

of Supply. The purpose of the conference was to intimate that the Churchill Government had decided to go ahead with the temporary housing programme and that they required Greenford to stop all war work in the foundry and start up the manufacture of baths as speedily as possible.

Post-War Reconversion

The factory closed down on war stores in the foundry at Christmas, 1944, and started to make baths by January, 1945. At this time the foundry was in the position of having less than half the personnel required to man a single shift. Compared with 1928, there was the advantage of having accumulated a certain amount of "know how," but against this the foundry had to offset the disadvantages of the labour supply position in 1945 as compared with 1928. The few trained men who had remained in the foundry throughout the war were undoubtedly beginning to show the effects of the strain of wartime production, and it was no mean achievement to establish an output of over 1,000 baths per week within about 12 months of starting up in January, 1945.

Many schemes were tried to ease the labour situation by importation from other areas of large batches, mainly from Northern Ireland and South Wales, but out of these organised attempts to rebuild the labour force the management considered itself fortunate if it retained one suitable man as a permanent member of the production squads out of about twenty men engaged.

Gradually the old foundry workers returned from the Services, *etc.*, and the management was able to resume double shift working in the foundry by the summer of 1946. In May, 1946, the output reached approximately 2,000 baths per week, and it has remained fairly steadily at this figure.

Film Commentary

During the showing of the film Mr. Young enlarged upon the pictorial display with facts and figures telling the story of present-day production at the Greenford plant.

Sand Plant—The first part of the film showed the sand-preparing plant where knock-out sand is first elevated on a 30-in. belt conveyor 110 ft. long at 18-deg. slope to a cooling tower 28 ft. high. From the cooling tower it passes through a rotary screen for the removal of heavy scrap before being conveyed on a 36-in. wide plough belt to storage hoppers which have a total capacity of 200 tons. The rotary screen feed is about 20 r.p.m., and has a 1¼-in. mesh. From the storage tanks the cooled sand is conveyed to a Simpson batch-type mill, where the appropriate percentage of moisture is added according to the state of the sand as it comes from the tanks. From the mill the sand is conveyed to storage tanks behind the stationary Sandslinging machines, each Sandslinger being serviced by two storage tanks.

Synthetic Sand—The moulds are rammed with a synthetic sand prepared with silica sand and a clay bond such as Bentonite 4 per cent., or Fulbond 6 per cent., or clay 9 per cent. The screen of prepared sand is as follows: On 40-mesh sieve, 25 per cent.; 60-mesh, 45

FIG. 4.—GENERAL VIEW OF THE CANTEEN

FIG. 5.—CANTEEN KITCHEN EQUIPMENT

per cent.; 80-mesh, 15 per cent.; 100-mesh, 7 per cent.; through 100-mesh, 7 per cent. The green bond advisable is 4 to 5 lb. per sq. in. with a permeability number of 200, the moisture being around 2 per cent.

At the base of the storage tanks a rotating-table feeder transfers the sand to a conveyor, where the scrap is removed by overband magneting separator and conveyed to a receptacle for removal to the cupola yard.

Moulding and Casting.—The hand moulder on bath work uses a single-shell pattern. On the development of the block, two "matched" patterns were established, one part to make the outside of the mould and the other part the inside. This block system is used on the Sandslinger plant, *i.e.*, two patterns are used for each bath. Again, while hand-made baths are always hand "finished" and run at the bottom (makers having their own ideas of the position of gates), in the case of baths made at Greenford, casting by the edge of the roll is considered necessary. This means extra metal for downgates and runners. The extra weight required varies with conditions, but is usually about 50 per cent. more than that for hand-made baths.

Metal Composition.—The general chemical and physical properties of the iron used for baths are governed to a considerable extent by supplies available. Because of the need to use a large percentage of bought-in scrap, it is necessary to add ferro-silicon and ferro-manganese to produce the following composition:—T.C, 3.20 per cent.; Si, 3.10; S, 0.070 to 0.100; P, 1.35; Mn, 0.50 per cent. Recent reports on American cast-iron bath metal confirm that they still use the low-phosphorus iron provided by their local suppliers. It will be observed from the above that a high-carbon equivalent, *viz.*, 4.6 to 4.7 per cent. is aimed at. In the U.S.A. they also aim at a carbon equivalent of around 4.65 per cent. Like the British Bath Company, they consider breakage is limited by control of the carbon in the above manner.

Iron is cast from bogies containing sufficient metal for four baths. The temperature of the metal for casting ranges from 1,360 to 1,320 deg. C., the temperature at the cupola spout averaging 1,410 deg. C. After the moulds are rammed, they are parted from the patterns and assembled on roller conveyors for pouring. At the cupola spout the metal is transferred to a 10-cwt. bogie and thence to the casting ladles.

Shot-blast Plant.—The continuous airless Wheelabrator plant was the first to be installed in the United Kingdom for the cleaning and preparation of bath castings for enamelling. It uses No. 18 chilled-iron angular shot and cleans 75 baths per hour. Each bath is conveyed by mono-rail past five wheels, which throw shot at a velocity of 14,000 ft. per min. The bath revolves slowly in the wheel area so that all parts are blasted. The wheels are also set at different angles for the same purpose.

Enamelling.—All the company's enamel is manufactured in the plant and melted in a reverberatory furnace. The ground-coat of enamel is first applied and the bath is then placed in the muffle furnace to fuse this coat. Next the bath is removed from the muffle and enamel powder is applied by means of vibrating boxes. After further firing in the muffle the enamelling is completed. The outside of the bath is painted by a spray gun, after which the baths are stacked ready for packing and despatch.

Foundry Amenities

At the Greenford works the foundrymen have long been provided with facilities for taking shower baths

(*Concluded on page* 136.)

British Blast Furnaces in the June Quarter, 1948

These tables are published through the courtesy of the British Iron and Steel Federation.

Derby, Leicester, Notts, Northants and Essex.

Name of firm.	In blast July 3, 1948, making :—				Weekly average in blast.		Total built.	Furnaces relining.
	Hematite.	Forge and foundry.	Basic.	Total.	June quarter.	March quarter.		
Clay Cross	—	1	—	1	1	1	2	—
Ford Motor	—	1	—	1	1	1	1	—
Kettering Coal & Iron	—	1	—	1	1	1	2	—
New Cransley Iron & Steel	—	1	—	1	1	1	2	1
Renishaw Iron	—	2	—	2	2	2	2	—
Sheepbridge Coal & Iron	—	2	—	2	2	2	2	—
Stanton Ironworks : Holwell	—	3	—	3	3	3	5	1
Stanton-by-Dale	—	5	—	5	5	4.9	5	—
Staveley Coal & Iron	—	3	1	4	4	4	4	—
Stewarts and Lloyds : Corby	—	—	4	4	3.7	3.5	4	—
Wellingboro' Iron	—	—	2	2	2	2	3	1
Total	—	19	7	26	25.7	25.4	32	3

Lancashire (excl. N.-W. Coast), Denbigh, Flint and Cheshire.

Brymbo Steel	—	—	1	1	1	1	1	—
Darwen & Mostyn	—	—	—	1*	1	1	1	—
Lancashire Steel Corp'n.	—	—	2	3†	3	3	4	1
Total	—	—	3	5	5	5	6	1

* Producing spiegeleisen. † Includes one producing ferro-manganese.

North-West Coast.

Barrow Hematite	2	—	—	2	1.9	2	4	1
Charcoal Iron	—	—	—	—	0.5	1	1	1
Millom & Askam	2	—	—	2	2	2	3	1
Workington Iron & Steel	2	—	—	2	2	2	3	1
Total	6	—	—	6	6.4	7	11	4

Lincolnshire.

Appleby-Frodingham	—	—	9	9	9	8.5	9	—
Lysaght, J. : Scunthorpe	—	—	2	2	2.8	3.2	4	2
Thomas, R., & Baldwins : Redbourn	—	—	2	2	2	2	2	—
Total	—	—	13	13	13.8	13.7	15	2

North-East Coast.

Cargo Fleet Iron	—	—	2	2	2	2.2	3	1
Consett Iron	1	—	1	2	2	2	2	—
Dorman, Long : Acklam	—	—	3	3	3	3	4	1
Redcar	—	—	2	2	2	2	2	—
Cleveland	—	—	3	3	3.2	4	5	—
Bessemer	—	—	3	3	3	2.5	3	—
South Bank	—	—	—	2*	2	2	4	1
Grangetown	—	—	—	—	—	—	2	—
Gjers, Mills & Co.	2	—	—	2	2	2	5	—
Pease & Partners	2	—	—	2	2	2	3	1
Skinningrove Iron	—	—	2	2	2	2	2	—
South Durham Steel & Iron	—	—	2	2	2	2	3	—
Total	5	—	18	25	25.2	25.7	38	4

* Producing ferro-manganese.

Scotland.

Bairds & Scottish Steel : Gartsherrie	1	1	1	3	3	3.2	5	1
Carron	—	1	—	1	1	1	4	1
Colvilles	—	—	3	3	3	2.9	3	—
Dixon's	—	2	—	2	2	2	6	1
Total	1	4	4	9	9	9.1	18	3

Work of the B.S.I.

Referring to the growing size and influence of the British Standards Institution, Lord McGowan, president, speaking at the recent annual meeting, said that more and more industries were becoming aware not only of the need for standards, but also of the advantages to themselves in co-operating with the Institution in the preparation of standards on a national scale. He pointed out that standardisation as a means of measuring the properties or assessing the value of goods was an important element in the proper conduct of industrial and commercial affairs and in the protection of the health and safety of the public; it was important also, said Lord McGowan, as a means of establishing satisfactory ranges of types and sizes and, where necessary, securing interchangeability.

The speaker stressed the importance of British Standards to the export trades, and recalled that he had asked all Industry Standards Committees of the Institution to re-examine their standards from the point of view of exports.

MR. V. C. PARKER, manager of an ordnance factory near Melbourne, is visiting Sunderland to study the Doxford engine on behalf of the Australian Government. The visit follows an agreement between Wm. Doxford & Sons, Limited, and Australia, for the manufacture in Australia under licence of Doxford's opposed piston oil engines.

Engineering Wages Inquiry

Courts of inquiry to investigate the wage applications made by the Confederation of Shipbuilding and Engineering Unions to the Engineering Employers' Federation and the Shipbuilding Employers' Federation are to be set up by the Minister of Labour. The claims were in each case rejected.

A meeting of the executives of the 37 unions in the Confederation on July 15 decided against a strike ballot, but instead to ask for an inquiry into the rejection of the claims and into the wage anomalies and profits of the industries.

The court of inquiry will be presided over by Sir John Forster. The other members will be Mr. C. W. Guillebaud, Mr. G. G. Honeyman, Mr. A. J. Espley, and Mr. Alfred Roberts.

ABOUT 1,500 WORKERS in the meter department of Ferranti, Limited, electrical engineers, of Hollinwood, near Oldham, are to be placed on a four-day working week.

SENOR DON ROBERTO QUEREJAZU CALVO, Bolivian Chargé d'Affaires, Señor Scott-Murga, Bolivian Counsellor, and Col. V. A. G. Cecil, of the Peruvian Corporation, visited the works of the Hunslet Engine Company, Limited, Leeds, on July 20, where they inspected a powerful 2-8-0 metre gauge locomotive which has been built for the Guaqui-La Paz Railway of the Peruvian Corporation. The party later visited Lofthouse Colliery.

British Blast Furnaces in the June Quarter, 1948—*cont.*

Staffordshire, Shropshire, Worcestershire and Warwickshire.

Name of firm.	In blast, July 3, 1948, making :—				Weekly average in blast.		Total built.	Furnaces relining.
	Hematite.	Forge and foundry.	Basic.	Total.	June quarter.	March quarter.		
Goldendale Iron	—	1	—	1	1	1	2	1
Grazebrook Cold Blast	—	—	—	—	—	—	2	—
Lilleshall	—	1	—	1	1	1	2	1
Round Oak Steelworks	—	1*	—	1	1	1	3	—
Shelton Steel & Iron	—	—	3	3	3	3	3	—
Stewarts and Lloyds : Bilston	—	—	2	2	2	2	3	—
Thomas, G. & R.	—	—	—	—	—	—	2	—
Total	—	3	5	8	8	8	17	2

* Cold-blast pig-iron.

South Wales and Monmouthshire.

Guest, Keen, Baldwins : Briton Ferry	1	—	—	1	0.7	—	1	—
Cardiff	1	—	2	3	3	3	4	1
Steel Co. of Wales : Margam	—	—	2	2	2	2	2	—
Thomas, R., & Baldwins : Ebbw Vale	—	—	2	2	2	2	3	1
Total	2	—	6	8	7.7	7	10	2

Sheffield.

Park Gate Iron & Steel	—	—	1	1	1	1	2	—
GRAND TOTAL	14	26	57	101*	101.8	101.9	149	21

* Includes four making ferro-alloys.

Number of Furnaces in Blast on July 3, 1948

District.	Weekly average in blast, June quarter.	Total in blast, July 3, 1948.	In blast July 3, making :—			
			Hematite.	Forge and foundry.	Basic.	Ferro-alloys.
Derby, Leics., Notts., Northants and Essex	25.7	26	—	19	7	—
Lancs. (excl. N.-W. Coast), Denbigh, Flint and Ches.	5	5	—	—	3	2
Lincolnshire	13.8	13	—	—	13	—
North-East Coast	25.2	25	5	—	18	2
Scotland	9	9	1	4	4	—
Staffs., Shrops., Worcs. and Warwick	8	8	—	3	5	—
S. Wales and Monmouth	7.7	8	2	—	6	—
Sheffield	1	1	—	—	1	—
North-West Coast	6.4	6	6	—	—	—
Total	101.8	101	14	26	57	4

Weekly Average Number of Furnaces in Blast during the Previous Six Quarters

District.	1948.	1947.		1946.		
	March.	Dec.	Sept.	June.	March.	Dec.
Derby, Leics., Notts., Northants and Essex	25.4	24.3	25.8	23.6	24.7	25.8
Lancs. (excl. N.-W. Coast), Denbigh, Flint and Ches.	5	4.7	3.9	4	3.9	3.9
Lincolnshire	13.7	13	11.4	10.7	11.6	11.8
North-East Coast	25.7	25	23.7	23.2	25.5	26
Scotland	9.1	8.5	8	8	10.2	10.2
Staffs., Shrops., Worcs. and Warwick	8	7.1	6.2	4.4	4.2	5.8
S. Wales and Monmouth	7	6.9	6.9	6.9	6.8	6.9
Sheffield	1	1	1	1.8	1	1
North-West Coast	7	7	6.3	6.4	6.8	6.8
Total	101.9	97.5	93.2	89	94.7	98.2

The following companies have furnaces in course of construction :—Darwen & Mostyn, 1 Lancashire Steel Corporation, 1 ; Steel Co. of Wales, 1.

Personal

MR. H. C. STREET has been appointed a director of the British Metal Corporation, Limited.

MR. S. FILDES has been appointed manager of the Newcastle-upon-Tyne branch of Musgrave & Company, Limited, fan and structural engineers, of Belfast. He succeeds MR. W. J. ADAMS in this position.

MR. H. N. EDWARDS and MR. A. T. CHEESLEY have been appointed directors of the Metropolitan-Cammell Carriage & Wagon Company, Limited, and the Patent Shaft & Axletree Company, Limited. Mr. Edwards has also been appointed assistant managing director of the Metropolitan-Cammell Carriage & Wagon Company.

MR. E. E. LITTLE, a director of Bell's Asbestos & Engineering, Limited, Slough, retired last week after 60 years' continuous service. He joined the company as an office boy in 1888, and among the many posts he has occupied with the firm is that of chief buyer. He was made a director of the company five years ago.

MR. J. H. D. HOBSON, a well-known Tees-side engineer, is shortly leaving the district to become general manager of F. Issels & Sons, Limited, Bulawayo, Southern Rhodesia, which has recently become associated with John Brown & Company, Limited. Mr. Hobson received his training at the Birtley Company, Limited, and for a number of years was a member of the gun-mounting and locomotive design staff of Sir W. G. Armstrong, Whitworth & Company, Limited, Newcastle-upon-Tyne. He went to Tees-side in 1927 as general manager of Worth & McKenzie, Limited, Stockton, and later was for several years with Ashmore, Benson, Pease & Company, Limited. In 1941, Mr. Hobson was appointed foundry manager of the Tees-side Bridge & Engineering Works, Limited, which appointment he is relinquishing to go to Rhodesia. He has been responsible for improvements in foundry mechanisation and for the installation of sand-handling plant and moulding machines. Mr. Hobson has been an active member of the Institute of British Foundrymen, and has served on the Council of the Middlesbrough branch, being vice-president during 1947-48; he is at present president-elect.

Wills

GREENACRE, EDWIN, of Lower Kingswood, Surrey, a director of the Falkirk Iron Company, Limited, and formerly a director of the Durban Falkirk Iron Company, Limited £519,334

TENNENT, R. B., chairman of R. B. Tennent, Limited, iron and steel founders, etc., of Coatbridge, Lanarkshire, and a director of the British Roll Makers' Corporation, Limited, Birmingham, and the British Adamite Alloy Roll Company, Limited, Dudley £63,673

ROBERTSON, SIR HENRY BEYER, governing director of the Pale & Brymbo Estates Company, Limited, chairman of the Brymbo Steel Company, Limited, Wrexham, a director of Baldwins (Holdings), Limited, and Broughton & Plas Power Coal Company, Limited, Wrexham £167,695

MORRISON, SIR WILLIAM MURRAY, formerly vice-chairman of the British Aluminium Company, Limited, chairman of the British & Colonial Bauxite Company, Limited, a director of James Booth & Company, Limited, non-ferrous metal manufacturers, etc., of Birmingham, and other companies £75,199

British Bathmaking Practice

(*Continued from page* 133)

and for canteen meals; recently these amenities have been extended and improved.

The washing accommodation and drying room are now housed in a new building of nearly 3,000 sq. ft. area and comprise 16 shower cubicles and 16 individual hand basins for the foundrymen and fettling-shop workers. These are arranged in two groups of eight, one group being shown in Fig. 1. A feature which applies only to the foundry workers (although other workers at the factory have separate shower baths, etc.) is the provision of drying-room and locker accommodation. This is housed adjacent to the shower room and comprises accommodation for 300; views of these sections are shown in Figs. 2 and 3. Each man in the foundry has a locker and, for his working clothes, a wire drying rack. Some men (those engaged on the dirtier jobs) are allowed the use of two lockers. Towels (in pairs) are purchased by each man through the company and are laundered at home, this having proved the best arrangement. Soap, at the rate of two tablets per month, is provided free of charge, and liquid soap is also available. Hot water at the showers and hand basins, and for circulating through the pipe frames of the drying room, is obtained from a single external oil-heated boiler and is thermostatically controlled at about 140 deg. F. The walls of the building are attractively tiled and mirrors are provided as insets.

The new canteen, a view of which is shown in Fig. 4, is a large, centrally heated, well-lighted building, with a floor area (including kitchen and stores) of about 3,500 sq. ft. There is present seating for 120 with room for more, and, in addition the canteen service supplies hot drinks and snacks from trolleys during the breaks in the working hours. About 75 per cent. of the operatives at present take full meals. The cooking facilities are so duplicated to use either solid fuel or gas and to that extent they are independent of failure of supply of either. All this equipment (part of the kitchen is shown in Fig. 5) was made by the Allied Ironfounders' group.

Development of Scottish Industries

A committee was being appointed immediately in connection with the Scottish Industries Exhibition to be held at the Kelvin Hall, Glasgow, in the autumn of next year, said Sir Steven Bilsland, chairman of the Executive Committee of the Scottish Council (Development and Industry), at a recent Press conference at Edinburgh. The exhibition would show the great development of existing Scottish industries since the war, as well as demonstrate the large number of new industries established in Scotland in the past 10 years, he said. It would also promote Scottish export trade and, finally, prepare the way for the Scottish contribution to the Festival of Britain Exhibition in 1951.

Sir Steven also announced steps to be taken towards making Scotland more self-supporting in such important building materials as lime and cement, practically all supplies of which at present come from England.

News in Brief

A NEW PATTERNSHOP is being built by the Darlington Railway Plant & Foundry Company, Limited.

THE 1949 FOUNDRY CONGRESS of the American Foundrymen's Society will be staged in St. Louis, Mo., from May 2 to 5.

ASSOCIATED BRITISH OIL ENGINES, LIMITED, has received an order for five 350-kw. Petter-Brush Diesel electric generating sets for delivery to Pakistan.

THE EYRE SMELTING COMPANY, LIMITED, Tandem Works, Merton Abbey, London, S.W.19, announces that annual holidays of the various departments of the works will conclude on August 16.

THE INAUGURAL MEETING of the South Wales branch of the Incorporated Plant Engineers will be held on September 28 in the lecture theatre of the South Wales Institute of Engineers, Park Place, Cardiff.

APPLICATION has been made to the Capital Issues Committee by the directors of Davey, Paxman & Company, Limited, boilermakers, ironfounders, etc., of Colchester, for permission to issue further shares.

THE ELIMINATION of ferrous contamination in the lubricating oil of the two new Diesel-electric locomotives of the British Railways (London/Midland Region) will be carried out by Philips magnetic filters.

WORK HAS STARTED on alterations to the works of Jarrow Metal Industries, Limited, Jarrow-on-Tyne. The work is mainly concerned with the installation of additional plant and the provision of railway sidings.

NEARLY 200 MEN who have completed a minimum of 50 years' continuous service with Colvilles, Limited, and its associated companies in Scotland, are to be presented with £50 each. Superannuated staff employees are to receive a gold watch.

THE APPOINTMENT is announced of the Caledon Shipbuilding & Engineering Company, Limited, Dundee, as naval architects and consultants to the Singapore Straits Steamship Company, Limited. Mr. John Liddle, a director of the Caledon Company, is to visit the Far East.

ELLIS FLOWER & SON, LIMITED, engineers' patternmakers and foundry consultants, of St. Helens, Lancs., has been appointed by J. Stone & Company, Limited, of Deptford, London, S.E.14, agents for the sales of the whole of the company's light alloy products in Lancashire, Yorkshire and Cheshire.

TO SUSTAIN recent record-breaking outputs of iron and steel, the Cargo Fleet Iron Company, Limited, last week restored to production a battery of silica coke ovens which in a period of 10 weeks has been completely reconstructed. The work was carried out by Gibbons Bros., Limited, Dudley.

CASH BONUSES, prizes and certificates have been presented to 180 junior employees of Newton, Chambers & Company, Limited, Thorncliffe, near Sheffield, as a token of the firm's appreciation of the fact that they had supplemented training at the works by voluntary attendance at further education establishments.

AUGUST 14 has been fixed by the directors of Guest, Keen & Nettlefolds, Limited, as the time limit within which holders of the 4 per cent. debenture stock must exercise their option to receive cash or 4½ per cent. preference (and cash) in satisfaction of their holdings. The 4 per cent. debenture stock is to be redeemed on August 31.

SPECIALLOID, LIMITED, has appointed Major Thomas I. Roworth, Corso Matteotti 20, Milan, as its direct factory representative in Italy. The company also announces the appointment of Sir Francisco Benancor Ascanio, of Viera y Clavijo No. 22, Las Palmas de Gran Canaria, Canary Islands, as its sole main distributor for pistons and pins in Las Palmas.

AFTER COMPLETING A TOUR of the Caledonian Works of A. F. Craig & Company, Limited, ironfounders and boilermakers, of Paisley, recently, Mr. J. H. Jones, Joint Parliamentary Secretary to the Ministry of Supply, referred to the valuable exports being made by the company which were helping to make available dollars for the things we needed in this country.

THE DIRECTORS of Ruston & Hornsby, Limited, announce that they are issuing 410,000 ordinary shares of £1 each, to be offered for subscription at 50s. per share to ordinary stockholders in the proportion of one new ordinary share for every £4 of ordinary stock held. In addition, ordinary stockholders are given the opportunity of applying at the price of 50s. per share for any of the 410,000 ordinary shares not required to meet acceptances under the Letters of Rights.

HAVING TERMINATED its agency agreement in Johannesburg, George Ellison, Limited, announces that future sales of Ellison switchgear and Tufnol in South Africa and the Rhodesias will be handled by George Ellison S.A. (Pty.), Limited, which has opened offices at 33, Stability Unit House, Simmonds Street, Johannesburg. The Ellison representation in Natal and for South African Collieries will remain in the hands of F. G. Licence (Pty.), Limited, Durban. Mr. S. J. C. Wells has been appointed manager of George Ellison S.A. (Pty.).

THE "NICKEL BULLETIN" for June contains an article which touches on the full range of non-ferrous castings, in which nickel plays an important part. The "Bulletin" also includes useful data on the approximate relationships between the various hardness numerals obtained from nickel and high-nickel alloys, in addition to numerous abstracts under the headings of electrodeposition, nickel-iron alloys, cast irons, constructional steels, and heat- and corrosion-resisting alloys. The "Bulletin" is obtainable free of charge from the Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

Changes of Name

The following companies have recently changed their names, the new titles being given in parentheses:—

PITHERS ENGINEERING, LIMITED, London, W.1 (Cotterell & Pither, Limited).

MANCHESTER FURNACES (1934), LIMITED, Manchester (Manchester Furnaces, Limited).

FRANK HARRIS BROS. (PLANT), LIMITED, Guildford (Franks Harris Bros. (Plant), Limited).

Company News

(Figures for previous year in brackets.)

Newman & Watson—Dividend of 7½% (6%).

H. & J. Hill (Willenhall)—Interim dividend of 15% (same).

Metal Industries—Final dividend of 7%, making 10% (same).

E.N.V. Engineering Company—Interim dividend of 7½% (same).

Cozens & Sutcliffe (Holdings)—Interim dividend of 25% (same).

Masson, Scott & Company—Dividend of 5% and bonus of 1½% (same).

Wolverhampton Metal Company—Final dividend of 20% (same and bonus of 5%), making 40% (same).

Richardsons Westgarth & Company—Dividend of 8% (10%), less tax, and an additional distribution of 2%, not subject to tax, from capital reserve (nil).

Hackbridge & Hewittic Electric Company—Final dividend of 8%, making 12% for the year ended March 31. The previous dividend of 6% is not comparable in view of the amalgamation and capital reorganisation in March, 1947, when the company was made public.

Gerrard Industries—Net profit, £18,270 (£17,719); unrequired tax reserve, £3,500 (nil); interim dividends on parent company, aggregating 25% (same total payment as previous year); to general and dividend equalisation reserve, £2,000 (nil); future tax reserve, £3,000 (nil); forward, £14,486 (£7,802).

Davey, Paxman & Company—Trading profit to March 31, £253,465 (£251,696); dividends, £478 (£562); to depreciation, £43,509 (£25,916); interest, £5,021 (£11,577); profits tax, £38,000 (£3,840); E.P.T., nil (£141,000); income tax (less tax on initial allowances £12,470), £92,000 (£26,813); net profit, £75,413 £43,112); replacement of plant, £30,000 (nil); contingencies, nil (£5,000); reserve, £15,000 (£25,000); dividend of 10%, £19,250 (£13,521); forward, £21,986 (£10,823).

Electrical Switchgear & Associated Manufacturers—Accounts for the year ended March 31 show:—Special dividend from Brookhirst Switchgear, Limited, £115,720; to tax, £52,074; leaving £63,646; transferred to capital reserve (proportion of special dividend earned prior to purchase of Brookhirst Switchgear), £23,946; special ordinary dividend, £39,700; dividend from Brookhirst Switchgear, £45,455; loan interest to Brookhirst Switchgear, £2,717 (£3,167); fees, £2 (same); making £48,174 (£20,547); to auditor's fee, £10 (same); administration expenses, £56 (£17); tax and loan interest, £21,379 (£1,143); general reserve, £20,000 (nil); preference dividend, £2,635 (£3,163); directors' fees, £600 (same); forward, £19,108 (£15,614).

JOHN LANG & SONS, LIMITED, Johnstone, near Glasgow, is to supply a turning lathe for Dawsholm Gasworks, Glasgow, at a cost of £2,971 10s.

Metallurgical Problems of the Services

Formation of Research Council

An Inter-Service Metallurgical Research Council has been set up by the Admiralty and Ministry of Supply to advise them on metallurgical problems of importance to the Services. The formation of this Council will provide for the interchange of ideas on metallurgical problems common to the different Services, and avoid overlap between their research programmes. It should also ensure that balance is maintained between fundamental and *ad hoc* research, and that the long-term research necessary for the provision of new alloys is embarked upon.

The Research Council includes representatives of the Admiralty and Ministry of Supply, and a number of distinguished metallurgists from the universities, industry and other Government departments. The independent members are:—

PROF. L. AITCHISON (chairman), Professor of Industrial Metallurgy, University of Birmingham; PROF. E. N. DA C. ANDRADE, F.R.S., Quain Professor of Physics, University College, London; PROF. G. WESLEY AUSTIN, Goldsmiths' Professor of Metallurgy, Cambridge University; MR. G. L. BAILEY, Director of the British Non-ferrous Metals Research Association; DR. R. W. BAILEY, research consultant, Metropolitan-Vickers Electrical Company, Limited; MR. H. H. BURTON, director of research, English Steel Corporation, Limited; DR. W. HUME-ROTHERY, F.R.S., Lecturer in Chemistry, Oxford University; DR. H. MOORE; MR. A. J. MURPHY, research director, J. Stone & Company, Limited Deptford, London, S.E.14; MR. D. A. OLIVER, director of research, B.S.A. group; DR. C. J. SMITHELLS, director of research, British Aluminium Company, Limited; Dr. C. SYKES, director of research, Brown-Firth Research Laboratories; DR. W. H. J. VERNON, Chemical Research Laboratory.

The secretary of the Council, is Mr. A. H. Waterfield, of the Ministry of Supply.

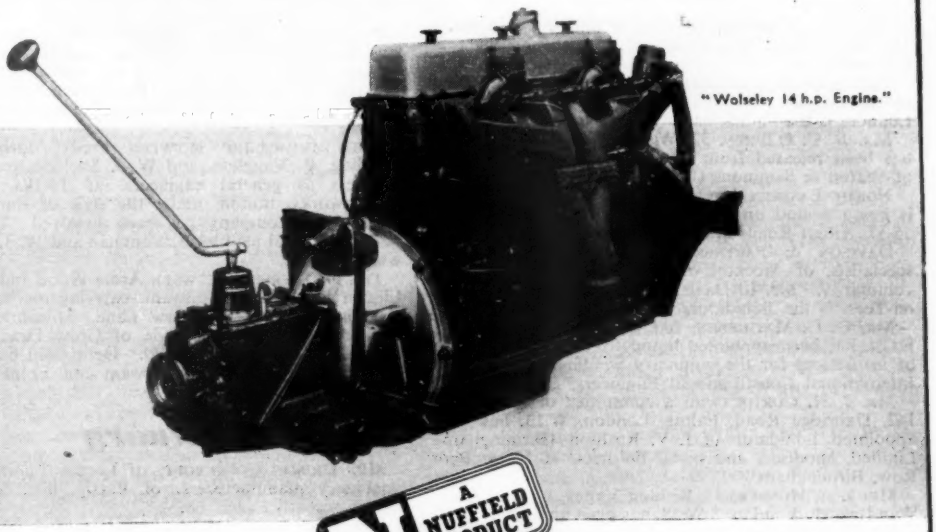
Contracts Open

The dates given are the latest on which tenders will be accepted. The address is that from which forms of tender may be obtained.

Brixworth, August 28—Supplying 25 miles of spun-iron pipes and cast-iron specials, 8 in. to 3 in. dia., for the Brixworth Rural District Council. Pick, Everard, Keay & Gimson, 6, Millstone Lane, Leicester. (Fee £2 2s., returnable.)

Stoke-on-Trent, August 12—Supply of cast-iron work, cast-iron pipes and specials, etc., for the Corporation. The City Surveyor, Town Hall, Stoke-on-Trent.

West Kesteven, August 31—Provision and laying of about 3,000 yds. of 6-in. and 1,300 yds. of 5-in. dia. iron-pipe water mains, for the Rural District Council. Elliott & Brown, Stanley House, Pelham Road, Nottingham. (Fee £3 3s., returnable.)



A NUFFIELD PRODUCT

Using

STANTON-DALE

REFINED PIG IRON

USED AND RECOMMENDED
FOR ALL HIGH-DUTY
ENGINEERING CASTINGS

THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Gazette

METALFIX, LIMITED, is being wound up voluntarily. Mr. W. J. Eley, 122, Colmore Row, Birmingham, is the liquidator.

THE UNION CABLE COMPANY, LIMITED, is being wound up voluntarily. Mr. C. H. I. Chown, Pinners Hall, London, is the liquidator.

MR. B. C. O'BRIEN, 32, Walton Road, Sidcup, Kent, has been released from his appointment as liquidator of Seaton & Sammons (Engineering), Limited.

NORTH EASTERN IRON REFINING COMPANY, LIMITED, is being wound up voluntarily. Mr. J. M. Farraday, 55-57, Albert Road, Middlesbrough, is the liquidator.

DAVISON & PARTNER, LIMITED, water-gas plant specialists, of Stockton-on-Tees, is being wound up voluntarily. Mr. L. Davis, Parkfield Works, Stockton-on-Tees, is the liquidator.

MR. D. D. MATHIESON, 103, Cannon Street, London, E.C.4, has been appointed liquidator (with a committee of inspection) for the voluntary winding-up of Anglo-International Constructional Engineers, Limited.

MR. J. H. CURTIS (with a committee of inspection), 162, Uxbridge Road, Ealing, London, W.13, has been appointed liquidator of J. V. Rushton (Birmingham), Limited, anodisers and metal finishers, of 12-14, Bath Row, Birmingham.

MR. J. A. HUNTER, 55, Bendon Valley, Garratt Lane, Wandsworth, London, S.W.18, has been appointed liquidator of A. H. Hunt, Limited, manufacturers of fixed capacitors, of Wandsworth, London, S.W.18, in place of Mr. R. J. Mack.

REGENT ENGINEERING COMPANY (HINCKLEY), LIMITED, is being wound up voluntarily. Mr. G. S. Ross and Mr. A. T. Wright, of Spring Hill Farm, Wykin, near Hinckley, and 520, Loughborough Road, Birstall, Leicestershire, respectively, are the liquidators.

THE PARTNERSHIP BETWEEN John William Bond, Jonathan Gwynne Evans and Albert Edward Coggins, carrying on business as engineers, at Edward Street, Bristol, under the style of East Bristol Engineers, has been dissolved as far as concerns J. G. Evans.

THE PARTNERSHIP BETWEEN Harold Ellor and Spencer Johnson, carrying on business as general brassfounders, at Wilkinson Street, Oldham, under the style of Ellor Johnson & Russell, has been dissolved. Debts will be received and paid by H. Ellor, who continues.

A WINDING-UP ORDER was made by the High Court on June 21 in connection with Fen Welding & Sheet Metal Works, Limited, 89, Kingsway, London, W.C.2. Tabard Welding & Sheet Metal Works, Limited, of the same address, was the subject of a similar order.

THE PARTNERSHIP BETWEEN Idris William Hodgkinson and Charles Oswald Hodgkinson, carrying on business as engineers, etc., as Kirkby Road, Sutton-in-Ashfield, Notts, under the style of Charles Hodgkinson & Sons, has been dissolved. Debts will be received and paid by I. W. Hodgkinson, who continues.

THE PARTNERSHIP BETWEEN William George Owen Davies and John Frederick Gist, carrying on business as consulting engineers at Royal Chambers, 25, Temple Row, Birmingham, under the style of Davies, Gist & Partners, has been dissolved. Debts will be received and paid by W. G. O. Davies, who continues.

THE PARTNERSHIP BETWEEN Harold Wheatley Dowling, Mary Charlotte Dowling, Dennis Ernest Edward Dowling, Kenneth Lawrence Dowling, and Charles Edward Adams, carrying on business as engineers and toolmakers, at 2A, Southview Road, Southwick, Sussex, under the style of H. W. Dowling & Sons, has been dissolved.

THE PARTNERSHIP BETWEEN Fred Aldred, James Holding, E. Vaughan, and W. J. Sheldon, carrying on business as general engineers, at 19-19A, Burnden Bleachworks, Bolton, under the style of Burden Park Engineering Company, has been dissolved. Debts will be received and paid by E. Vaughan and W. J. Sheldon, who continue.

THE PARTNERSHIP BETWEEN Arnie Wood and Geoffrey Linden Rossendale Whitwam, carrying on business as welding engineers, at Crow Lane, Milnsbridge, near Huddersfield, under the style of Crow Lane Welding Company, has been dissolved. Debts will be received and paid by G. L. R. Whitwam and Frank Thorpe, who continue.

Obituary

MR. THOMAS COCKCROFT, of Lord's, Limited, loom machinery manufacturers, of Bacup, died at Morecambe recently, aged 68.

MR. WILLIAM STIRLING, who retired as outside manager with Napier Bros., Limited, marine engineers, of Glasgow, in 1931, has died at the age of 82. He was responsible for supervising the installation of the steering equipment into the battleships Nelson and Rodney, and luxury ships such as the Empress of Britain and the Normandie.

MR. ELIJAH PAGE, managing director of the Steel Construction Company, Limited, Motherwell, has died after an illness lasting for several weeks. Mr. Page, who was 65 years of age, was for several years a member of the executive committee of the Scottish Structural Steelworks' Association. His elder son, Mr. Roydon Page, has been associated with his father as works manager of the Steel Construction Company at Whitegates, Wishaw.

SIR CLIFFORD COPLAND PATERSON, F.R.S., director since 1919 of the research laboratories of the General Electric Company, Limited, Wembley, died at his home at Watford on July 26. Sir Clifford, who was 68, had been a director of the company since 1941. He studied at Faraday House, and during the period 1901-18 was on the staff of the National Physical Laboratory. During his career, Sir Clifford was concerned with many important developments at a time when rapid progress was being made in the use of electricity. In 1936 he gave the annual May lecture before the Institute of Metals, taking as his subject "The Escape of Electricity from Metals: Its Practical Consequences." He was president of the Institution of Electrical Engineers in 1930-31, and of the Institute of Physics in 1937-38. He was chairman of the Council of the British Standards Institution and a member of the Advisory Committee of the D.S.I.R.